

CLAIMS

1. A sound diffuser with low frequency sound absorption, comprising:

a) a body having a front surface configured to diffuse sound waves; and

b) means incorporated into said front surface for absorbing sound waves below a desired cut-off frequency.

2. The invention of Claim 1, wherein said front surface includes a plurality of divided or non-divided parallel wells.

3. The invention of Claim 1, wherein said front surface includes a two-dimensional pattern of geometrical or irregular shape chosen from the group consisting of cylindrical, conical, pyramidal, polygonal or rectangular.

4. The invention of Claim 3, wherein said shapes are separated by slots or holes.

5. The invention of Claim 4, wherein said incorporated means is formed in said slots or holes.

6. The invention of Claim 1, wherein said front surface comprises a compound curved shape.

7. The invention of Claim 1, wherein said incorporated means comprises a plurality of open slots.

8. The invention of Claim 1, wherein said incorporated means comprises a plurality of holes.

9. The invention of Claim 8, wherein said holes comprise a first set of relatively large holes and a second set of relatively small holes.

10. The invention of Claim 9, wherein said sets of holes are arranged in rows of holes.

11. The invention of Claim 10, wherein each row of holes is located within a well of a diffusive surface.

12. The invention of Claim 10, wherein each row of holes is located across a plurality of wells of a diffusive surface.

13. The invention of Claim 1, further including an absorptive material overlying a rear surface of said body.

14. The invention of Claim 13, wherein said absorptive material is made of a porous absorptive material chosen from the group consisting of fiber glass, mineral wool, cotton and foam.

15. The invention of Claim 7, wherein the slots are narrow enough to provide significant low frequency absorption.

16. The invention of Claim 7, wherein the holes are narrow enough to provide significant low frequency absorption.

17. The invention of Claim 15, wherein said slots have a width of 0.1 to 1 millimeter.

18. The invention of Claim 16, wherein said holes have a diameter of 0.1 to 1 millimeter.

19. The invention of Claim 1, wherein a crossover frequency is chosen below which sound absorption takes place and above which diffusion takes place in accordance with required usage.

20. A method of making an acoustical device which absorbs sound below a crossover frequency and diffuses sound above said crossover frequency, including the steps of:

a) choosing a desired crossover frequency;

b) calculating a number of perforations to be formed in an existing diffuser and their respective areas by using existing standard acoustic formulations such as:

where f is the peak absorptive frequency, c is the speed of sound in air, S is the cross-sectional area of a hole, L is the apparent depth of a perforated sheet, and V is an enclosed volume in a cavity;

c) forming perforations of desired dimensions through a front surface of said diffuser to create said device;

d) designing a diffusive surface shape of said diffuser to create diffusion above the crossover frequency using techniques including but not limited to number theory and acoustical optimization;

e) installing said device.

21. The method of Claim 20, wherein said front surface includes a plurality of divided or non-divided parallel wells.

22. The method of Claim 20, wherein said front surface includes a two-dimensional pattern of geometrical or irregular shapes chosen from the group consisting of cylindrical, conical, pyramidal, polygonal or rectangular.

23. The method of Claim 22, wherein said shapes are separated by slots or holes.

24. The method of Claim 20, wherein said front surface comprises a compound curved shape.

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